SOCIETIES AND ACADEMIES

London

Geological Society, Feb. 23.—Prof. P. Martin Duncan, F.R.S., president, in the chair.—The Rev. David Charles, D.D., Thomas Musgrave Heaphy, C.E., William Smethurst, Edward Horatio W. Swete, M.D., and John Thomas Young were elected Fellows, and Prof. Joseph Gosselet, of Lille, a Foreign Correspondent of the Society.—The following communications were read:—On the greenstones of Western Cornwall, by Mr. John Arthur Phillips, F.C.S. In this paper the author brought forward evidence to show that the so-called "greenstones" of Penzance really belong chiefly to the following three classes:—*a*. Gabbros or Dolerites, in which the originally constituent minerals are either to a great extent unchanged, or, sometimes, almost entirely represented by pseudomorphic forms. *b*. Killas, or ordinary clay-slates. *c*. Highly basic hornblendic rocks, exhibiting a tendency to break into thin plates; these under the microscope present the appearance of metamorphosed slates. Slaty rocks of a character intermediate between *b* and *c* also occur. In the Cape Cornwall district the "greenstones" are chiefly hornblendic slates, sometimes with veins or bands of garnet, magnetite, or axinite. The rocks near the Gurnard's Head are almost identical with those of Mount's Bay. The crystalline pyroxenic rocks and metamorphic slates of the St. Ives district exactly resemble those of Penzance. The greenstones between St. Erth and St. Stephen's are probably altered ash-beds or hardened hornblendic slates; unlike the hornblendic and augitic rocks of the other districts, they do not occur in the immediate vicinity of granite, but elvan courses are always found near them. The percentage of silica in the two series of rocks is nearly constant; the hornblende slates contain about 10 per cent. less silica than the crystalline pyroxenic rocks, and there is an excess of iron oxides to nearly the same extent, their composition in other respects being very similar. The Killas is an acidic rock of essentially different chemical composition.—On columnar, fissile, and spheroidal structure, by the Rev. T. G. Bonney. Some of the above structures have comparatively recently been discussed by Mr. Mallet and Prof. J. Thomson. Both these authors agree in attributing columnar structure to contraction due to loss of heat while cooling, but differ in their explanation of cross jointing and spheroidal structure. In this paper it is sought to show that the principle proved by Mr. Mallet to be the explanation of the columnar structure is capable of a wider application. After a brief notice of some instances of columnar structure, the author described cases of a fissile structure seen in certain igneous rocks (especially in the Auvergne phonolites), closely resembling true cleavage, and often mistaken for it; also the tabular jointing of rocks; a peculiar form of this, where most of the segments are of a flattened convexo-concave form; spheroidal structure and cup-and-ball structure. He showed by examples that Prof. Thomson's explanation of spheroidal structure was inadequate, and gave reasons for considering all these structures to be due to contraction. He also discussed more particularly the cup-and-ball structure, giving reasons for thinking that the spheroidal and the horizontal fissures were often to some extent independent of each other.

Physical Society, Feb. 26.—The president, Prof. G. C. Foster, F.R.S., in the chair.—The following candidates were elected members of the Society:—The Rev. R. Abbay, M.A., and Mr. W. Bottomley, sen.—Mr. A. Haddon exhibited and described a form of tangent galvanometer, so arranged that by the aid of an electric lamp an image of the needle can be projected on the screen, and its deflections thus made evident to large audiences. A horizontal beam of light falling on a mirror inclined at 45° is thrown vertically upwards. In its path it meets with a glass box containing a lozenge-shaped magnet about three-quarters of an inch long; above this needle is a graduated semicircle. The pivot supporting the needle is fixed in the centre of the glass plate which forms the bottom of the box. Above this box is a lens, and on the top of the whole is a second reflector parallel to the first. On either side of the needle is a hoop of stout brass wire, fourteen inches in diameter, one end of each hoop being insulated by a piece of ebonite, while the other end is in metallic connection with a brass ring which slides easily over the circular base of the instrument. The hoops are separated from each other by a distance equal to half the diameter of either hoop, *i.e.*, 7 inches. The instrument having been placed at a distance from the screen equal to the focal length of the lens, and the needle brought to zero by rotating the graduated scale, the hoops are placed parallel to the magnetic meridian, and the instrument is ready for action. As an illustration of the manner in which the galvanometer is employed, Ohm's Law was proved in the cases of large and small external resistance.—Mr. O. J. Lodge, B.Sc., then described some investigations on which he has recently been engaged in reference to the flow of electricity in plane bounded surfaces, in continuation of a paper read before the Society in the early part of last year, by Prof. G. C. Foster and himself. After some introductory considerations, he pointed out that all the conditions of the flow of electricity are known for any number of poles in an unlimited sheet. The problem then consists in reducing cases of poles in bounded plates to corresponding cases in the unlimited plane, such that the flow conditions on the bounding line may be the same in both cases. The determination of these data, however, for limited planes of certain forms presents considerable difficulty. In studying questions of this nature there are two kinds of lines which must be considered. These are "equipotential lines," *along* which no electricity passes, and "lines of flow," *across* which no electricity passes. The boundary of any conducting surface will of course always be a line of flow, and, in a bad conductor, we can form an equipotential line by laying a band of copper in the required direction. If, therefore, in studying a surface of limited extent in contact with an electrode, we can find a point or points outside the surface such that, if they be made electrodes, the boundary line of the surface becomes a line of flow, we are at liberty to treat the surface as part of an infinite plane, and all the circumstances are therefore known. To take the simplest case, a straight line in an infinite surface will be a line of flow if equal sources be placed in pairs on opposite sides of the line so that one is the virtual image of the other; but, if the components of each pair are of opposite sign, it becomes an equipotential line. To make a circle of radius (r) an equipotential circle, we require a source A, within, and a sink B, without, such that $CA.CB = r^2$. To make it a line of flow we require two sources, such that $CA^1.CA = r^2$ and an equal sink at C, the centre of the circle. The cases of an infinitely long straight strip and of a surface bounded by two straight lines inclined at an angle θ were then referred to, and Mr. Lodge showed that the first requires an infinite number of external sources arranged on a straight line, and the second an infinite number on a circle except when θ is a submultiple of π, the number then becoming finite. Diagrams of the images for certain cases of triangles and squares were also shown. The dimensions of the electrodes in contact with conducting surfaces are not matters of indifference. In a plane bounded by straight lines the electrodes within and without the boundary are of equal size, but when the boundary is a circle the areas of electrodes vary as the squares of their distances from the centre. It was then pointed out that not only the poles may be reflected in this way, but also every point in the sheet; and if the lines of flow or of potential are drawn inside a given circle for any arrangement of poles, the lines outside can be immediately obtained from them by inversion with regard to the centre of the circle by means of a Peaucellier cell. The author then described the manner in which the principle of Wheatstone's Bridge can be employed for tracing out lines of equal potential. If A and B be a source and sink on a conducting ring, and P any point on the ring between A and B and Q any point between B and A, then P and Q are of equal potential whenever $\frac{PA}{PB} = \frac{QA}{QB}$. If now the wire under the point P be flattened out into a surface, the above expression holds good for a certain line on that surface, which is therefore an equipotential line. Similarly by flattening out the wire under the point A, the line for which the expression then holds good is a line of flow for a certain distribution of poles. At this point the reading of the paper was adjourned to the next meeting of the Society.—Prof. McLeod exhibited a glass plate covered with a film of silver which had in places been deflagrated by means of Leyden jars, the poles being placed at varying distances apart. The form of the surface acted upon tended towards the Lemniscate of Bernouilli.

Paris

Academy of Sciences, Feb. 21.—Vice-Admiral Paris in the chair.—The death of M. Brongniart was announced.—The following papers were read:—Meridian observations of small

planets, made at the Observatory of Greenwich (sent by the Astronomer Royal) and at the Observatory of Paris, during the fourth quarter of 1875, by M. Leverrier.—Theorems relative to the displacement of a plane figure, two points of which glide in two curves of any order and class, by M. Chasles.—Remarks on the laws of storms, by M. Faye. The older meteorology places the origin of great atmospheric movements in the lower layers, the new meteorology traces them to upper currents of the region of cirrhus.—On fire-damp, by M. Faye. Instead of trying to suppress all causes of ignition (which is evidently impracticable, and has for result the allowing of large quantities of gas to accumumulate till an explosion comes), would it not be well to supply the ceilings of the galleries with small open lamps every ten or twenty metres, so as to constantly burn the gas as it was presented? M. Berthelot gave some reasons against this method.—On the rotatory power of styrolène, by M. Berthelot.—On the invariability of great axes of the orbits of planets, by M. Tisserand.—Report on an apparatus of M. Vinot for recognising stars.—On the principles which ought to govern the construction of common lodgments (for men and animals), by M. Tollet. Outline of memoir. Barracks constructed, under the author's directions, for the eighth Army Corps, have realised an economy over the old system, of 300 francs per man, and 50 to 60 francs per horse, or 600,000 to 800,000 francs per regiment.—On the coefficient of dilatation of the air under atmospheric pressure, by MM. Mendéléeff and Kaiander. The most probable number is $\alpha = 0{\cdot}0036843$, or about $\frac{1}{2}\frac{1}{8}\frac{1}{5}$ instead of $\frac{1}{3}\frac{1}{0}\frac{1}{0}\frac{1}{0}$, which has been adopted hitherto.—On some remarkable points in magnets, by M. Blondlot. If a very short magnetic needle, supported at its centre of gravity, be carried along near the surface of a magnet, then among its varying directions, those normal to the surface of the magnet are remarkable; the points to which they correspond M. Blondlot terms *orthogonal points*. One property of these points is that if a small magnetic body be placed at one of them, more mechanical work will be required to remove it from there to an infinite distance, than if it had been placed at any other neighbouring point on the surface of the magnet. Another property: the positions of equilibrium of a small magnetic body in relation to a magnet are precisely the orthogonal points.—Composition of the dark matter that is obtained in calcining ferrocyanide of potassium, by M. Terreil. It is a mixture containing, in minute division, cast-iron, magnetic oxide of iron, free carbons, and a small quantity of cyanide of potassium.—On the formation of anhydrous acids of the fatty and the aromatic series, by the action of phosphoric acid on their hydrates, by MM. Gal and Etard.—On the products of the action of chloride of lime on amines, by M. Tscherniak.—Reply to the reclamation of M. Plateau, on the subject of digestion of insects, by M. Jousset. M. Jousset disputes M. Plateau's statement that in insects in the normal state, the digestive juices are all alkaline or neutral, never acid; also that the liquid secreted by the gastric cœcums acts on starch but not on albuminoid substances.—M. Husson gave details of a process for testing, by means of sulphate of soda, the resistance of stones to frost.—M. Beyris described a convenient syphon, which consists of a caoutchouc tube; one end has a valve opening inwards, the other a stop-cock. The tube, stretched straight, is filled with liquid and the cock closed; you then put the valve end in the liquid, curve the tube, and open the cock.

Feb. 28.—Vice-Admiral Paris in the chair.—The following papers were read:—On the explosion of powder, by M. Berthelot. The chemical transformation is expressible, in every case, by a simultaneous system of very simple equations.—Researches on a sulphate which seems to contain a new oxide of manganese, by M. Fremy.—On the influence of mould on the nitrification of azotised substances of organic origin, employed as manures, by M. Boussingault. In sand and chalk there was little nitrification; it was in mould already nitrifiable, that all the azotised organic matters developed most nitric acid and least ammonia.—On fire-damp, by M. Faye. The ascent of the light protocarburetted hydrogen to the upper parts, takes place immediately, and it would there be burnt without danger. M. Berthelot replied.—On the methods of meteorology, by M. Sainte-Claire Deville.—Proposal made by Bouguer, in 1726, for obtaining from the log-books of all ships, by professors of hydrography, information useful to navigation, by M. de la Gournerie.—M. Dupuy de Lome, in presenting a work by M. Ledieu, "Les Nouvelles Machines Marines," recommended it for the application made of the mechanical theory of heat, to comparative examination of new engines.—Report on the memoir published by Messrs. Noble and Abel, "Researches on explosives, fired gunpowder."—Report on a memoir of M. Alb. LePlay, on a system of irrigation of meadows by means of rain-water in the mountainous and impermeable strata of Limousin.—Note on the meridian circle of the imperial observatory of Rio de Janeiro, by M. Liais.—The heart experiences at each phase of its revolution changes of temperature which modify its excitability. Note by M. Marey. The cooling corresponds to the phase of less excitability.—On the oil of Elæococca, and on its solid modification produced by the action of light, by M. Cloëz.—Means of preventing explosions of fire-damp, by the employment, *a tergo*, of compressed air, by M. Buisson. He would convey pure compressed air in pipes to the bottom of the mine, and drive the vitiated air outwards.—Note on the tracing of gearings by arcs of a circle; improvement on the method of Willis, by M. Léauté.—On some combinations of titanium (second note), by MM. Friedel and Guérin. This treats of the oxychloride and the sesquioxide.—On sulpho-phenylurea, by M. de Clermont.—On the antiseptic properties of borax, by M. Schnetzler. The body of a horse which had lain four months in a layer of borax earth in California, was quite fresh and odourless, the pupil clear and bright, the hair supple and well attached.—Reply to M. Glénard's last note on the *rôle* of carbonic acid in the phenomenon of spontaneous coagulation of the blood, by MM. Mathieu and Urbain.—On the reducing sugar of raw sugars, by M. Müntz.—Note on a new genus of fossil Entomostraca from the carboniferous system of Saint Etienne (*Palæocypris Edwardsii*), by M. Ch. Brongniart.—On the half November oscillation in America, by M. Hinrichs. This is as well marked, from Iowa up to Newfoundland as in Europe and Algeria. Curves are given.—On the manufacture of superphosphates destined for agriculture, by M. Millot. The retrogradation of these, after their ordinary preparation, is due to the presence, in the natural phosphates, of sesquioxides, and especially of sesquioxide of iron.—On movement in the hairs and foliar laciniations of *Drosera rotundifolia* and in the leaves of *Pinguicula vulgaris*, by M. Heckel. This refers to the action of chloroform and sulphuric ether placed near the plant under a bell jar. The effect was at first irritant, but, where the dose was not too strong (*e.g.*, three drops of chloroform) the organs soon returned to a state of repose. The jar having been removed, it took eighteen minutes, in this case in open air, for the irritability to be removed.—Meteoric combustions, by M. De Fonvielle. He suggests a method of ascertaining aërostatically the amount of dust in a given layer of air. At the end of a pole is placed a surface of some square decimetres, held horizontal, one of the sides covered with very pure glycerine. Let H be the vertical height traversed by the aërostat, S the sticky surface in square decimetres, and p the weight of dust received. The amount in a cubic metre will be $\frac{p \times 100}{HS}$.—Reclamation of priority concerning the mechanism of an electric lamp, presented by M. Girouard.

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